

## ***What is this list?***

This document lists methyl bromide alternatives, by crop, that were identified by international technical advisory groups under the Montreal Protocol. A corresponding list addressing the regulatory availability of these alternatives in the U.S. will also be available ([www.epa.gov/ozone/mbr/us\\_matrix.html](http://www.epa.gov/ozone/mbr/us_matrix.html)) in a short time.

This international list includes “non-chemical or chemical treatments and/or procedures that are technically feasible for controlling pests” (Methyl Bromide Technical Options Committee (MBTOC), 1998). Thus, if the cell at the intersection of a specific alternative and a given crop contains a reference, the TEAP has asserted that the specific practice or chemical has “technical potential” to replace methyl bromide in at least one circumstance (Technical and Economic Assessment Panel (TEAP), 1997).

This list of alternatives is derived directly and solely from past reports produced by the United Nations’ technical committees and panels: the Methyl Bromide Technical Options Committee (MBTOC) reports ([http://www.teap.org/html/methyl\\_bromide\\_reports.html](http://www.teap.org/html/methyl_bromide_reports.html)) and Technology and Economic Assessment Panel (TEAP) reports ([http://www.teap.org/html/teap\\_reports.html](http://www.teap.org/html/teap_reports.html)).

TEAP developed this list in response to the request of the countries that have ratified the *Montreal Protocol on Substances that Deplete the Ozone Layer* (paragraph 3 of Decision XIII/11).

## ***How do I use this list?***

**This international list represents a baseline for all methyl bromide users in the world. This international list does not address U.S. or local regulatory issues, such as registration status, or location-specific technical issues affecting the use of the alternatives. Furthermore, the list does not address the economic feasibility or environmental impact of the alternatives.** EPA does not necessarily believe that alternatives in the list are feasible for U.S. methyl bromide users.

If you are considering applying for a critical use exemption (<http://www.epa.gov/spdpublic/mbr/cueqa.html>) from the phaseout of methyl bromide, you should consult the U.S.-specific version of this list when it is available ([http://www.epa.gov/ozone/mbr/us\\_matrix](http://www.epa.gov/ozone/mbr/us_matrix)). The U.S. version of the list of methyl bromide alternatives will take into account the U.S. registration status of chemical alternatives.

## ***How should I respond to this list?***

EPA plans to request applications for critical use exemptions in mid-2002. A notice will be published in the Federal Register that will formally request applications and delineate how to apply for a critical use exemption from the 2005 phaseout, including how to respond to the alternatives in the lists. Applicants will be expected to address technical, regulatory, and economic issues that limit the adoption of chemical alternatives for their crop in the U.S. list. Applicants will be expected to address technical, regulatory, and economic issues that limit the adoption of non-chemical alternatives listed for their crop in the international list.

Alternatives to Post Harvest Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)	Durables (general)	Artifacts	Beverages (coffee, cocoa, tea)	Cereal (grain) products	Cotton	Dried fish and meats	Dried fruit and nuts	Grains (general)	- Barley	- Rice	- Wheat	Herbs and spices	Pulses (grain legumes)	Seeds for planting	Timber and timber products	Tobacco	
In kind alternatives (fumigants)																	
Carbon bisulphide (carbon disulfide)	B-201		A-138, B-106, D-115	D-121				A-138, B-106	D-115								
Chloropicrin															A-273		
Carbon dioxide (high pressure)		A-162, B-107, B-131, B-137	B-263			B-107, B-131, E-77, D-122, C-56			E-76	D-121	B-107, B-137						
Carbon dioxide + sulfur dioxide																	
Carbon monoxide																	
Carbonyl sulphide	A-138, B-107, B-202, E-75	A-168	A-138, B-129					A-138, B-129, D-115	B-107	B-107				A-138, B-107, B-150, D-115			
Controlled and modified atmospheres (carbon dioxide, nitrogen, argon)	B-109, B-98, B-263, C-9	A-168, B-145, C-56	A-139, A-150, B-110, B-125, B-263, B-289, C-56, D-121	A-162, B-129, B-131		A-158, B-129, B-131, B-133, B-289, D-115	A-139, A-150, B-110, B-125, B-263, B-289	A-139, B-110, B-126, B-289	B-289	D-165, B-138				B-149, C-53			
Cyanogen				B-116, B-129				B-116, B-129									
Ethyl or methyl formate		A-168		A-138, B-110, B-129, E-76		A-138, A-158, B-110, B-134, E-76, C-56	A-138, B-129, E-76	E-76	E-76								
Ethylene oxide			A-139, B-110	A-139	A-139, B-110		B-110	A-139, B-110						A-139, A-164, B-137, B-110			
Hydrogen cyanide	A-137, B-98, B-112, C-49	A-168, B-144		A-162											A-272		
Methyl Iodide	E-76																
Methyl isothiocyanate (MITC)				A-138, B-116, B-129				A-138, B-116, B-129						E-77, E-78			
Phosphine alone and in combination	A-136, B-112, B-97, B-118, B-262, D-92, D-117, C-8	A-168, B-289, E-75, D-145	A-162, B-121	A-149, B-98, B-117, C-9, C-54, D-117, D-121	D-121, C-54	A-175, B-147	B-175, D-121, D-122	A-137, A-149, B-110, B-128, B-263, B-289, D-117, D-121	D-121, D-122	D-121, D-122	A-164, B-138	A-149, B-122, C-54	A-174, B-142, D-272, B-145, B-121, D-150, D-121, D-122, C-54	A-166, B-138, B-140, B-289, C-54			
Propylene oxide	E-76		E-76, D-114			E-76	E-76						E-76, D-114				
Sulfuryl fluoride	A-139, E-75, D-92	A-168, B-145, B-271						E-75, E-77, D-118							A-168, A-171, A-272, B-97, B-98, B-120, B-145, B-150, B-263, B-271, B-289, E-78, D-118, D-121, C-53, C-54		
Sulphur dioxide																	

Alternatives to Post Harvest Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)	Perishables	Cut flowers and ornamentals	Fresh fruits	Vegetables	Root crops	Structures	Domestic premises	Flour mills	Transport	Aircraft	Freight containers	Other vehicles
<b>In kind alternatives (fumigants)</b>												
Carbon bisulphide (carbon disulfide)		B-201										
Chloropicrin												
Carbon dioxide (high pressure)	A-204					A-267, E-77			B-161, C-56			
Carbon dioxide + sulfur dioxide			D-133									
Carbon monoxide		A-266										
Carbonyl sulphide	B-202		D-127									
Controlled and modified atmospheres (carbon dioxide, nitrogen, argon)		A-205, A-211, B-195, B-199, B-264, D-126	A-211, A-215, A-224, B-195, B-199, B-205, D-126, C-49	A-219, B-195	B-195	A-140, A-267, A-269, B-110, B-126, B-133, B-156, C-9			B-160, B-161	B-160	B-161	B-161
Cyanogen												
Ethyl or methyl formate	A-204	A-204		A-219				E-76				
Ethylene oxide												
Hydrogen cyanide	A-204, A-213, B-201	A-222, A-226, B-212	A-216, A-226	A-219, A-226, B-222		A-267, A-269, A-272, B-112, B-152, B-157, B-263, C-54, C-56			B-160, B-161, C-56	B-160, B-161, C-56,		A-275
Methyl iodide			D-127, D-134									
Methyl isothiocyanate (MITC)	B-116											
Phosphine alone and in combination	D-93, D-127, E-78		B-201, E-78, D-127			A-137, A-268, A-269, A-272, A-283, B-119, B-152, B-158, B-262, D-117, C-9			B-119, D-117	A-149, B-160, B-161, D-117, D-121, C-56, C-60	B-161, B-161, D-118	A-275, B-161, B-161, D-117
Propylene oxide												
Sulfonyl fluoride	D-118					A-138, A-268, A-272, B-97, B-120, B-152, B-154, B-159, B-263, B-271, D-118, D-122, C-54, C-56	A-268, B-98, B-150, B-154	E-77, E-78	B-161, B-271, D-118	B-161, B-271		
Sulphur dioxide	A-204		A-213, A-217, B-201									

Alternatives to Post Harvest Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)		Perishables	Cut flowers and ornamentals	Fresh fruits	Vegetables	Root crops	Structures	Domestic premises	Flour mills	Transport	Aircraft	Freight containers	Other vehicles
<b>Not in kind alternatives and combinations</b>													
Aerosol formulations of pesticides	C-49	A-213, A-221, B-202, B-212, C-49	C-49	C-49									
Biological agents							A-145, B-105						
Chemical soaking/dips and fumigation	D-93, D-125	A-213, A-221, A-226, B-202, B-212, C-51	D-125	A-219, A-226, B-202, B-222	B-217								
Cold storage + low oxygen			D-133										
Cold treatment		A-204, A-210, B-194, B-264, C-48		A-204, A-210, A-215, A-217, A-220, A-223, B-194, B-205, B-215, D-126, C-7, C-49, C-52	A-219		A-152A-267, A-274, B-155, D-122						
Cold treatment + sulfur dioxide			D-134										
Contact insecticides alone or with pest-free certification							A-140, B-108, B-151, B-156			C-56			
Controlled atmosphere + heat			D-133, D-134										
Cultural practices/Integrated pest management (IPM)/Integrated commodity management (ICM)	A-208, A-212, A-205, B-191		A-222, C-8, C-49	C-49			A-266, A-269, B-114, B-127, B-157, B-180, C-56	A-266					
Debarking													
Dichlorvos	A-204	A-204, A-213, A-222								C-9			
Electrocution							A-274, B-153	A-274, B-153					
Heat treatment	A-205, A-210, A-212, B-196, B-200, B-264, C-48, D-93, D-128	C-49	A-210, A-220, A-224, A-236, B-196, B-219, B-200, B-243, D-129, C-7, C-49, C-52	A-210, A-219, A-224, B-196, B-211, B-222, C-7, C-49, C-52, D-129	A-218, B-216, C-49	A-271, A-274, A-281, B-152, B-216, C-157, E-75, D-92, D-115, D-122, D-128		A-271, A-281, B-111, B-112, C-57, D-115, E-75					
Heat treatment + cold treatment			D-133, C-49										
Heat treatment + irradiation			D-134										
Heat treatment + removal of pulp													
High pressure water alone or with insecticide		C-49	D-130										
Hot water + cold treatment			D-134										
Inert dust/diatomaceous earth							A-142, A-151, A-270, A-271, A-273, B-127, B-157, D-116, D-122						
Inspection and certification	A-204, A-209, B-193	A-209, A-221, A-223, C-49	A-215, A-223, C-49	A-219, A-223, C-49	A-218, C-49								

<b>Alternatives to Post Harvest Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)</b>	<b>Perishables</b>	<b>Cut flowers and ornamentals</b>	<b>Fresh fruits</b>	<b>Vegetables</b>	<b>Root crops</b>	<b>Structures</b>	<b>Domestic premises</b>	<b>Flour mills</b>	<b>Transport</b>	<b>Aircraft</b>	<b>Freight containers</b>	<b>Other vehicles</b>
Irradiation	A-205, B-197, D-93, D-130	A-221, D-130, D-131	A-212, A-217, A-220, A-215, A-225, B-197, B-205, B-207, B-217, D-93, D-130, D-131, C-8, C-49, C-52	B-197, B-223, D-130	A-218, B-216, C-49							
Pest exclusion and physical removal		A-221				A-270, A-274, B-151		A-266				
Pest Resistant Packaging												
Pest-free zones	A-204, A-209, B-193		A-215, A-223, C-7, C-49, C-52	A-219, A-223, C-7, C-49, C-52								
Pesticides of low volatility (organophosphates, pyrethroids, Insect growth regulators, botanicals)		D-127				A-150, B-151, D-122						
<b>Not in kind alternatives and combinations</b>												
Pheromones					B-117, B-158		A-282, B-117					
Physical removal/cleaning/sanitation	B-200, B-264	C-49	A-225, B-200, B-219	A-225, C-49	A-145, A-270		A-266, B-128					
Physical removal + pesticide	C-49											
Preservatives (timber)						C-56		C-56				
Rodenticide												
Soapy water + brushing			C-49									
Steam treatments alone or with pressure												
Vacuum treatment/Hermetic storage												
Water submersion				C-57								
Wax coating alone or with soapy water			D-132, C-49									

	<b>Durables (general)</b>	Artifacts	Beverages (coffee, cocoa, tea)	Cereal (grain) products	Cotton	Dried fish and meats	Dried fruit and nuts	Grains (general)	- Barley	- Rice	- Wheat	Herbs and spices	Pulses (grain legumes)	Seeds for planting	Timber and timber products	Tobacco	
									A-145, B-105, B- 124								
<b>Alternatives to Post Harvest Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)</b>																	
<b>Not in kind alternatives and combinations</b>																	
Aerosol formulations of pesticides															C-49		
Biological agents	A-146		B-131	A-145, B-105, B- 124		B-105, B-131	A-145, B-105, B- 124			B-105		B-105					
Chemical soaking/dips and fumigation															A-174, B- 140	A-171, B- 150, C-53	
Cold storage + low oxygen																	
Cold treatment	B-97, B- 107, C-8, C-9, C-53	A-143, A- 169, B- 107, B- 144, C-9, C-55, C- 56	A-163, B-133	A-143, A-152, B- 107, B-124			A-159, B-129, B-133	A-152, B-107, B- 124				A-165, B- 137	B-107, B- 142	A-274	A-167, B- 139		
Cold treatment + sulfur dioxide																	
Contact insecticides alone or with pest-free certification	C-8, C-9, C-53	A-168, B- 144	C-55	A-140, A-146, B- 108, B-125		A-175	A-158, C-55	A-140, A-146, B- 108, B-125		C-56	C-56	C-56		A-171, B- 148, C-56	A-166		
Controlled atmosphere + heat																	
Cultural practices/Integrated pest management (IPM)/Integrated commodity management (ICM)	B-98, B- 114	B-98, B- 144, C- 55	A-162	B-124, B-127, D- 121			A-157, B-134, D-122	B-127, B-128, B- 275, D-121			B-275	B-137	B-142	B-149	B-139		
Debarking															A-171, B- 150, B-263, D-115, C-56		
Dichlorvos			A-168		B-98, B-125, C- 55, C-56			A-150, B-98, B- 108, B-125, C-9, C-55									
Electrocution																	
Heat treatment	B-97, B- 263, C-8, C-9, C-53, C-57	A-169, B- 144	A-163, B-134	A-144, A-151, B- 111, B-126, C- 56		A-159, B-134	A-144, A-151, B- 111, B-126	A-151, B-126, C- 57	A-151, B- 126	A-151, B- 126	A-165, B- 137	A-174, B- 142	A-171, A- 172, A-274, B-111, B- 149, B-289, E-77, D-92,	A-167, B- 139			
Heat treatment + cold treatment																	
Heat treatment + irradiation																	
Heat treatment + removal of pulp															C-49		
High pressure water alone or with insecticide																	
Hot water + cold treatment																	

Alternatives to Post Harvest Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)	Durables (general)	Artifacts	Beverages (coffee, cocoa, tea)	Cereal (grain) products	Cotton	Dried fish and meats	Dried fruit and nuts	Grains (general)	- Barley	- Rice	- Wheat	Herbs and spices	Pulses (grain legumes)	Seeds for planting	Timber and timber products	Tobacco
<b>Not in kind alternatives and combinations</b>																
Inert dust/diatomaceous earth	A-142, D-116		D-121	A-142, B-112, B-127, B-289, D-121				A-142, A-150, B-99, B-112, B-127, B-289, D-121		D-121, D-122			B-112			
Inspection and certification													C-49			
Irradiation	B-115, B-263, D-116	A-168, B-145	A-162, B-134	A-144, A-145, A-151, B-127	A-175, B-147	A-159, B-134	A-144, A-145, A-151, B-127	A-151	A-194, B-127, B-178, B-289	A-151	A-165, B-137	A-145	A-171, B-149	A-166, B-139		
Pest exclusion and physical removal															A-274	
Pest Resistant Packaging	B-135			C-56		C-56										
Pest-free zones																
Pesticides of low volatility (organophosphates, pyrethroids, Insect growth regulators, botanicals)	A-142, D-114			A-141, A-142, B-106, B-108, B-114, B-116, B-125, D-121		A-158	A-141, A-142, A-145, A-150, B-106, B-108, B-114, B-116, D-121	A-158	A-158	A-158	A-158	A-174		B-139		
Pheromones				B-117			A-152									
Physical removal/cleaning/sanitation	A-145			A-145		A-160	A-145						A-174, B-142, C-49			
Physical removal + pesticide													C-49			
Preservatives (timber)														A-172, A-273		
Rodenticide																
Soapy water + brushing																
Steam treatments alone or with pressure								C-57					C-56			
Vacuum treatment/Hermetic storage	B-263							B-289	B-289	D-121					C-57	
Water submersion													C-57	C-56		
Wax coating alone or with soapy water																

	Nursery/seedbeds - General	Strawberry nurseries (runners)	Forest tree nursery	Tobacco seedlings	Strawberries - fruit	Curcubits- General	Cucumber	Melon	Squash	Watermelon	Solanaceous Crops - General	Tomato	Pepper	Eggplant	Root Crops	Carrot	Potato	Sweet Potato
<b>Alternatives to Pre-Plant Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)</b>																		
<b>In kind and other chemical alternatives</b>																		
1,3-Dichloropropene (1,3-D, Telone ®)				B-86	B-83, B-281					B-83, B-281, B-287	B-87	B-87						
1,3-D, Brush burning	B-87, B-286		B-87, B-286															
1,3-D, Chloropicrin	B-88, E-71	E-71		B-88	B-54, B-55, B-86, E-71, D-107					B-51	B-5, B-37, B-51, B-54, D-107	B-5, B-37, B-51						
1,3-D, Chloropicrin, Metam sodium	B-55	B-55			B-85													
1,3-D, Chloropicrin, Pebulate ®												B-51, B-72	B-51, B-72					
1,3-D, Metam sodium	B-90, E-71	E-71																
1,3-D, Metam sodium, Basamid ®					B-281					B-281								
Basamid ®	A-104, B-87, B-286, B-288		A-104	B-87, B-286	B-86, B-285	B-281				B-284, B-287	B-87, B-287	B-284, B-287						
Basamid, Chloropicrin					B-55													
Basamid, Solarization												B-49		B-55				
Chloropicrin	B-88			B-88	B-50, B-86	B-83				B-83, B-87	B-87	B-87						
Sodium tetrathiocarbonate (Enzone ®)																		
Metam sodium	A-104, B-286		A-104	B-286	B-52, B-86, B-90, B-285	B-83, B-281				B-52, B-83, B-281, B-287	B-87, B-287	B-83, B-87, B-287						
Metam sodium, Chloropicrin					B-55, E-72													
Metam sodium, Crop rotation							B-39, B-74	B-39, B-74	B-39, B-74		B-39, B-74	B-39, B-74	B-39, B-74					
Metam sodium, Solarization														B-55				
Methyl iodide					E-72								E-72					
Methyl isothiocyanate (MITC)	B-88		B-88								B-83, B-281, B-284, B-288, E-73							
Nematicides					E-73	B-83, B-281												
Ozone					B-53								B-53	B-53				
Potassium azide	E-73																	
Propargyl bromide										E-73								

Alternatives to Pre-Plant Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)																		
Not in kind alternatives																		
	Nursery/seedbeds - General	Strawberry nurseries (runners)	Forest tree nursery	Tobacco seedlings	Strawberries - fruit	Cucurbits- General	Cucumber	Melon	Squash	Watermelon	Solanaceous Crops - General	Tomato	Pepper	Eggplant	Root Crops	Carrot	Potato	Sweet Potato
Biofumigation	A-102, B-41, B-84, B-88, B-91, B-92, B-93, B-283, B-286, E-73 B-92, E-73	B-92, E-73	A-102	B-41, B-88, B-93, B-286	B-86, B-93, B-94	B-83	B-91, B-94	B-41, B-94	B-94	B-94	A-71, B-41, B-83, B-87, B-91, B-92, B-94 B-41, B-87, B-92, B-94	B-41, B-87, B-92, B-94						
Solarization	A-102, B-36, B-48, B-84, B-88, B-91, B-92, B-94, B-283, B-285 B-92, B-285	B-92, B-285	A-102	B-88, B-94, B-285	A-77, B-86, B-92, B-94, B-285	B-83, B-281	A-77, B-91	B-94	B-94	B-94	A-100, B-49, B-71, B-83, B-92, B-94, B-281 B-71, B-86, B-87, B-92, B-94	B-71, B-86, B-87, B-92, B-94	A-77, B-94	B-48				
Solarization, fungicides											B-71	B-71	B-71	B-55				
Steam	A-77, B-36, B-49, B-84, B-90, B-91, B-283, B-285, B-286, E-74 B-286			B-286	B-86, D-111	B-83, B-90, B-282	B-91			B-83, B-90, B-282	B-86, B-90	B-86	B-49					
Approaches that avoid the need for methyl bromide																		
Biological control	B-45, B-84, B-88, B-283, B-286			B-88, B-286	B-86	B-83	B-45, B-91, B-92	B-45, B-92	B-45, B-92	B-45, B-83, B-87, B-91, B-92, B-285 B-87, B-92, B-287	B-87, B-92, B-287	B-45, B-87	B-44					
Cover crops and mulching	B-42, B-91, B-286	B-42		B-286	A-66, A-109, B-42, B-285		B-91			A-74, A-77, B-91, B-284	A-66, B-42, B-287	B-284						
Crop residue compost	B-288									B-40	B-40	B-40						
Crop rotation/fallow	A-102, B-84, B-90, B-91, B-94, B-286, B-288, E-73 E-73	A-102, B-288	B-286	A-109, B-39, B-86, B-94, B-285	B-83, B-282	B-91, B-94	B-94	B-94	B-94	A-73, B-83, B-87, B-93, B-94, B-99, B-282, E-74 B-79, B-87, B-93	B-87, B-93, B-94, B-282	A-74, E-74	A-74, E-74					
Endophytes					A-73					A-73								

**Alternatives to Pre-Plant Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)**

**Not in kind alternatives**

	Nursery/seedbeds - General	Strawberry nurseries (runners)	Forest tree nursery	Tobacco seedlings	Strawberries - fruit	Cucurbits- General	Cucumber	Melon	Squash	Watermelon	Solanaceous Crops - General	Tomato	Pepper	Eggplant	Root Crops	Carrot	Potato	Sweet Potato	
Flooding and water management	A-102, B-90		A-102	B-42, E-74		E-74				A-74, A-77, B-42	E-74		E-74	B-42, E-74	B-42		E-74		
General IPM	A-102, B-43, B-91, B-94, E-73	E-73	A-102	A-109, B-93, B-94, B-285	B-91, B-94, B-288	B-94, B-288	B-94, B-288	B-94, B-288	B-91, B-94, B-285, B-288	B-38, B-93, B-94, B-286, B-288	B-93, B-94		B-81						
Grafting/Resistant rootstock/Plant Breeding	B-47, B-74, B-84, B-92, B-94			B-92, B-94	B-36, B-83	A-76, B-46, B-94, B-281, B-281, D-91, D-105, D-109	A-76, B-46, B-94, B-281, D-91, D-91, D-105, D-109	A-76, B-46, B-47, B-94, B-281, B-282, D-91, D-105, D-109	A-76, B-46, B-47, B-83, B-94, B-281, B-282, D-91, D-105, D-109	A-76, B-87, B-94, B-287, B-87, B-94	A-76, B-94	B-46							
Organic Amendments/Compost	A-108, B-38, B-40, B-84, B-91, B-283, B-285, B-286		B-38	B-285, B-286	B-86, B-285				B-281, B-283	B-40, B-87, B-287	B-40, B-87	B-283	A-75, B-284	A-75	B-284				
Organic Production	B-288				A-109, B-93		B-91												
Physical removal/Sanitation	A-102, B-42, B-43		A-102																
Planting time												B-41							
Ploughing and tillage	A-102		A-102									B-41							
Resistant cultivars	B-84, B-286			B-286	B-86, B-285	B-83, B-282	B-83, B-282	B-83, B-282	B-83, B-282	B-83, B-87, B-94, B-282, B-283, B-284, B-288	B-46, B-87, B-94, B-287	B-87, B-94, B-284	B-94, B-283						
Resistant rootstock, solarization, chemical	B-55																		
Soilless culture	B-44, B-77, B-88, B-273, B-285, E-70, E-73, D-90, D-105, D-110, D-112	B-44, B-77, E-73		B-44, B-88, B-273, B-285, E-70, E-73, D-90, D-105, D-110, D-112	B-44, D-112	B-83, B-282	B-83, B-282	B-83, B-282	B-83, B-282	B-44, B-83, B-282	B-44, B-287								
Substrates/Plug plants	A-64, A-75, B-77, B-84, B-90, B-92, B-94, B-283, B-285, B-286, E-73	B-77, B-90, E-73		B-92, B-285, B-286, E-73	B-86, B-90, B-94, B-285, D-112	B-83, B-90, B-94, B-282				B-87, B-90, B-94, B-284, B-285, B-287, B-288	B-87, B-90, B-94, B-286, B-287	B-87, B-94, B-284, B-287	B-94						

	Other vegetable crops	Cabbage	Cauliflower	Lettuce	Onion	Pea	Ornamentals - general	Rose	Carnation	Chrysanthemum	Fruit, Nut Trees - Replant	Banana	Citrus	Nuts	Vineyard	Stone & Pome Fruit	Sod/Turf
<b>Alternatives to Pre-Plant Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)</b>																	
<b>In kind and other chemical alternatives</b>																	
1,3-Dichloropropene (1,3-D, Telone ®)							B-84, B-85, B-284, B-285	B-85, B-284, B-285			B-85, B-281	B-85, B-281	B-85				B-85
1,3-D, Brush burning																	
1,3-D, Chloropicrin							B-55				B-85	B-5, B-85					
1,3-D, Chloropicrin, Metam sodium																	
1,3-D, Chloropicrin, Pebulate ®																	
1,3-D, Metam sodium							B-90, B-284	B-284			B-55						
1,3-D, Metam sodium, Basamid ®																	
Basamid ®							B-86, B-282	B-86			B-85	B-85					B-288
Basamid, Chloropicrin								B-55									
Basamid, Solarization							B-55										
Chloropicrin								B-84									
Sodium tetrathiocarbonate (Enzone ®)																B-53	
Metam sodium								B-84, B-86, B-282, B-284, B-285	B-86, B-284, B-285		B-85	B-85					
Metam sodium, Chloropicrin								B-55, B-282									
Metam sodium, Crop rotation							B-39, B-74	B-55									
Metam sodium, Solarization							B-55										
Methyl iodide																	
Methyl isothiocyanate (MITC)								B-84									
Nematicides	B-283										B-281	B-281	B-281				
Ozone																	
Potassium azide																	
Propargyl bromide																	

	Other vegetable crops	Cabbage	Cauliflower	Lettuce	Onion	Pea	Ornamentals - general	Rose	Carnation	Chrysanthemum	Fruit, Nut Trees - Replant	Banana	Citrus	Nuts	Vineyard	Stone & Pome Fruit	Sod/Turf	
<b>Alternatives to Pre-Plant Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)</b>																		
<b>Not in kind alternatives</b>																		
Biofumigation						B-84, B-93				A-71, B-41, B-85, B-91	B-41, B-85		B-91	B-41, B-91				
Solarization				B-49		A-99, B-83, B-84, B-86, B-286, B-282	B-86		A-77, B-85	B-85, B-94	B-85, B-92	A-77, B-91	B-91					
Solarization, fungicides					B-55													
Steam				B-90		B-49, B-79, B-83, B-86, B-90, B-282, D-111, E-74	B-79, B-86	B-79	B-79	B-91			B-91	B-91				
<b>Approaches that avoid the need for methyl bromide</b>																		
Biological control						B-45, B-79, B-83, B-85, B-282, B-284	B-85, B-284			B-85, B-91	B-85	B-85	B-91	B-85, B-91	B-85			
Cover crops and mulching										A-77, B-91			B-91	A-106, B-91				
Crop residue compost						B-40, B-79	B-79	B-79	B-79					B-40				
Crop rotation/fallow						B-39, B-84, B-94, B-282		B-39	B-39	B-39, B-85, B-91, B-94	B-85, B-94	B-39	B-91	A-106, B-91				
Endophytes																		
Flooding and water management						B-42				A-74, A-77	A-74, B-281							
General IPM						B-79, B-81, B-94, B-282	B-79	B-79	B-79		B-94		B-91	A-106, B-91				

Alternatives to Pre-Plant Uses of Methyl Bromide (A=UNEP 1995, B=UNEP 1998, C=UNEP 1999, D=UNEP 2000, E=UNEP 2001)	Other vegetable crops	Cabbage	Cauliflower	Lettuce	Onion	Pea	Ornamentals - general	Rose	Carnation	Chrysanthemum	Fruit, Nut Trees - Replant	Banana	Citrus	Nuts	Vineyard	Stone & Pome Fruit	Sod/Turf
<b>Approaches that avoid the need for methyl bromide</b>																	
Grafting/Resistant rootstock/Plant Breeding						B-85, B-92, B-94	B-85			A-76, B-46, B-85, B-91, B-94	B-94	B-46	B-85, B-91	A-106, B-46, B-85, B-91	B-85		
Organic Amendments/Compost	B-281	B-281				B-84, B-282, B-283, D-110				B-85, B-281	B-85, B-281		A-75, B-91	A-106, B-91			
Organic Production																	
Physical removal/Sanitation						B-43, B-79	B-79	B-79	B-79	B-43		B-43					
Planting time																	
Ploughing and tillage						B-46, B-79, B-84, B-85, B-282, B-284	B-79, B-85, B-284	B-46, B-79	B-79	B-85	B-85		B-283	A-106			
Resistant cultivars							B-44, E-70, E-73, D-90, D-110				B-44	B-44					
Resistant rootstock, solarization, chemical																	
Soilless culture					B-90, B-283		B-79, B-84, B-85, B-90, B-94, B-282, E-73	B-79, B-85	B-79	B-85, B-281	B-85, B-94, B-281		B-85	B-85			
Substrates/Plug plants																	